

## PATENT ABSTRACTS OF JAPAN

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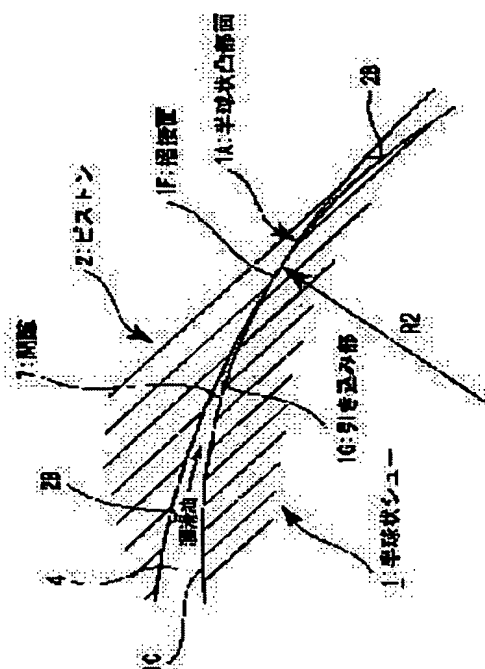
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## (54) HEMI-SPHERICAL SHOE

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a hemi-spherical shoe 1 having an excellent slide characteristic and along service life.

SOLUTION: A hemi-spherical shoe 1 is provided with a hemi-spherical convex surface 1A slidably coming contact with a hemi-spherical concave surface 2A of a piston 2. The hemi-spherical convex surface 1A is formed of a convex surface of a rotary body obtained when a circular arc having a radius R2 with the center C offset from an axial line L of the hemi-spherical shoe 1 in the orthogonal direction of the axis L, is rotated around the axis line L as a rotary center. An edge portion on a top side of the hemi-peripheral convex surface 1A forms a drawing portion 1G with a circular arc cross-section which keeps a space 7 between the drawing portion 1G and the hemi-peripheral concave portion 2A. A lubricating oil stored in a space portion 4 can be smoothly supplied through the space 7 to a sliding contact surface 1F.



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CLAIMS

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[Claim(s)]

[Claim 1] In the hemispherical shoe equipped with the end face which fitting is carried out to the hemispherical crevice of the 1st moving-part material, and \*\*\*\*s to there, the hemispherical heights side which slides, and the flat side of the 2nd moving-part material The hemispherical shoe characterized by forming the hemispherical crevice of the above-mentioned 1st moving-part material, and the hemispherical heights side on which it slides by the convex of the body of revolution which can do the radii which the core was located in the location which shifted only the predetermined dimension, and were drawn in the direction which intersects perpendicularly with it from the axis by rotating the above-mentioned axis as the center of rotation.

[Claim 2] The hemispherical shoe according to claim 1 characterized by setting the dimension of R1-R2 as the dimension exceeding 150 micrometers when the spherical diameter (radius) of the hemispherical crevice of the above-mentioned 1st moving-part material is set to R1 and the radius of the above-mentioned radii is set to R2.

[Claim 3] The dimension which shifts the core of the above-mentioned radii in the direction which intersects perpendicularly from an axis is a hemispherical shoe given in each of claim 1 characterized by being set as 20 thru/or 500 micrometers, and claim 2.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the suitable hemispherical shoe for making it intervene between the piston of a swash-plate-type compressor, and a cam plate, concerning a hemispherical shoe.

[0002]

[Description of the Prior Art] Conventionally, the hemispherical shoe equipped with the end face which fitting is carried out to the hemispherical crevice of a piston, and \*\*\*\*s to there, the hemispherical heights side which slides, and the flat side of a cam plate is common knowledge. And the hemispherical shoe with which only the predetermined dimension set up small the spherical diameter R2 of the above-mentioned hemispherical heights side to the spherical diameter R1 of the hemispherical crevice of a piston is also known further (for example, JP,7-5259,Y). In the hemispherical shoe indicated by this JP,7-5259,Y, since it is set as the dimension relation which mentioned above the hemispherical crevice and the hemispherical heights side, a gap is maintained between the field of the entrance side in the hemispherical crevice of a piston, and the front face of the hemispherical heights side of the hemispherical shoe which counters it. Therefore, a lubricating oil is introduced into the above-mentioned gap from the entrance side in a hemispherical crevice, and this lubricating oil is further supplied to the sliding part of a hemispherical heights side and a hemispherical crevice by rocking of the shoe accompanying the include angle of a cam plate. Moreover, in the hemispherical shoe of above-mentioned JP,7-5259,Y, the cross-section radii-like space section is formed between the crownings of the hemispherical crevice which has formed the notching \*\*\*\* flat side and counters the flat side and it in the field by the side of the crowning of a hemispherical heights side. And the appearance by which the lubricating oil stored by these space circles is also supplied to the sliding part of a hemispherical heights side and a hemispherical crevice has intention.

[0003]

[Problem(s) to be Solved by the Invention] However, in the hemispherical shoe of above-mentioned JP,7-5259,Y, since, as for the flat side by the side of the crowning in a hemispherical heights side, that edge serves as an acute angle, the gap between the edge of this flat side and a hemispherical crevice is very small. Therefore, there was a fault that the lubricating oil of space circles between the flat side of the hemispherical heights side of a hemispherical shoe and the crowning of a hemispherical crevice was hard to be supplied to the sliding part of a hemispherical heights side and a hemispherical crevice. Furthermore, the hemispherical crevice of the piston after getting used, and the sliding section of the hemispherical heights side of a shoe became to some extent large width of face, and when rocking of a shoe was small, or when a cam-plate include angle was small, they also had the fault that the lubrication of the center of the sliding section could not fully be carried out.

[0004]

[Means for Solving the Problem] In the hemispherical shoe equipped with the end face which fitting of this invention is carried out to the hemispherical crevice of the 1st moving-part material, and \*\*\*\*s to there, the hemispherical heights side on which it slides, and the flat side of the 2nd moving-part material in view of such a situation The hemispherical crevice of the above-mentioned 1st moving-part material and the hemispherical heights side on which it slides are formed by the convex of the body of revolution which can do the radii which the core was located in the location which shifted only the predetermined dimension, and were drawn in the direction which intersects perpendicularly with it from the axis by rotating the above-mentioned axis as the center of rotation.

[0005] according to such a configuration -- the edge of the field by the side of the crowning of the hemispherical heights side of a hemispherical shoe -- a cross section -- since it becomes circular, a cross-section wedge-like gap comes to be maintained between the edge of the field by the side of this crowning, and the crevice which counters it. Therefore, the lubricating oil

stored by the space circles between the field by the side of the crowning of the hemispherical heights side of a hemispherical shoe and the crowning of the hemispherical crevice of the 1st moving-part material becomes that the sliding part of a hemispherical heights side and a hemispherical crevice is easy to be supplied through the wedge gap of the above. Therefore, a sliding property is good and can offer a hemispherical shoe with a long life. Furthermore, hit width of face of the hemispherical crevice of the 1st moving-part material and the hemispherical heights side of a hemispherical shoe can be made narrower than before, and when rocking of a hemispherical shoe is small, or even when whenever [ tilt-angle / of the 2nd moving-part material ] is small, a lubricating oil can be effectively supplied to the center of the sliding section.

[0006]

[Embodiment of the Invention] If this invention is explained about an illustration example below, the swash-plate-type compressor is equipped with the hemispherical shoe 1, the piston 2 by which both-way migration is carried out in the vertical direction on a drawing, and the flat cam plate 3 which rotates with a revolving shaft in drawing 1. Hemispherical crevice 2B is formed in end-face 2A of the above-mentioned piston 2. In this example, hemispherical crevice 2B is formed so that the whole region may serve as the same curvature by the spherical diameter (radius) R1. The hemispherical shoe 1 is equipped with hemispherical heights side 1A which carried out the shape of a semi-sphere, and smooth end-face 1B. The part used as the crowning (upper part side on drawing 1) of hemispherical heights side 1A contacts hemispherical crevice 2B, and is setting the part to non-contact section 1C. Moreover, hole 1D of an outline cone form is formed in the shank (center) of end-face 1B. The hemispherical shoe 1 is making end-face 1B contact a cam plate 3 at the same time it fits hemispherical heights side 1A into hemispherical crevice 2B of the above-mentioned piston 2. Thus, the field of hemispherical heights side 1A where the hemispherical shoe 1 made to intervene between hemispherical crevice 2B and a cam plate 3 adjoins boundary section 1E of hemispherical heights side 1A and end-face 1B and it is in the condition of having exposed to the method of outside [ / (inlet port) / of hemispherical crevice 2B / edge 2], and having exposed to the space section between end-face 2A of a piston 2, and a cam plate 3. Moreover, while the space section 4 is formed of above-mentioned non-contact section 1C and hemispherical crevice 2B of the piston 2 which counters it, the space section 5 is formed by hole 1D and the cam plate 3. These space sections 4 and 5 function as a reservoir for storing a lubricating oil temporarily, and a lubricating oil is stored by those interior. Furthermore, the cross-section wedge-like gap 6 is maintained between the field which adjoins edge 2A' (inlet port) in hemispherical crevice 2B, and hemispherical heights side 1A which counters it. Therefore, in this example, the field of hemispherical heights side 1A which consists of this gap 6 the non-contact section 1C side (space section 4 side) is sliding-surface 1F with the above-mentioned hemispherical crevice 2B (field shown with the slash of right going up to drawing 1). And rotation of the above-mentioned cam plate 3 carries out both-way migration of the piston 2 through the hemispherical shoe 1. While end-face 1B of the hemispherical shoe 1 and a cam plate 3 slide in that case, sliding-surface 1F of hemispherical heights side 1A slide with hemispherical crevice 2B. Moreover, since the lubricating oil currently stored in the space section 4 by the side of the above-mentioned crowning also permeates the sliding part of sliding-surface 1F and hemispherical crevice 2B of hemispherical heights side 1A while the sliding part of sliding-surface 1F and hemispherical crevice 2B of hemispherical heights side 1A is supplied, after a lubricating oil is introduced in the above-mentioned edge 2' gap 6 from a side in that case, the above-mentioned slide contact part can be cooled. Moreover, the lubricating oil stored by the above-mentioned space section 5 permeates the slide contact part of end-face 1B and a cam plate 3, and cools the part. In addition, the hole same in the center section of above-mentioned non-contact section 1C, i.e., the crowning of hemispherical heights side 1A, as hole 1D by the side of end-face 1B may be formed.

[0007] By carrying out a deer, by forming hemispherical heights side 1A of the hemispherical shoe 1 as follows, this example is constituted so that the lubricating oil stored by the above-mentioned space section 4 may be easy to be supplied to sliding-surface 1F of hemispherical heights side 1A. That is, in this example, you make it located in the location which carried out [ predetermined \*\*\*\*\* ] Core C in the direction which intersects perpendicularly with it from the axis L of the hemispherical shoe 1, the radii of a radius R2 are drawn, and the convex of the body of revolution which can do the radii when rotating the above-mentioned axis L as the center of rotation is set to above-mentioned hemispherical heights side 1A. And above-mentioned non-contact section 1C is formed for the crowning side of the above-mentioned body of revolution. This non-contact section 1C may constitute non-contact section 1C according to the flat side where a cross section is loose and which intersects perpendicularly with the above-mentioned axis L, although it is circular. In this example, the radius R2 of the above-mentioned radii is made into the dimension smaller than the spherical diameter (radius) R1 of hemispherical crevice 2B, and it is set more as the dimension to which R1-R2 exceed 150 micrometers in a detail. Moreover,

in this example, the distance which shifts the above-mentioned core C in the rectangular direction from an axis is set as 20 thru/or 500 micrometers. Thereby, cross-section radii-like G [ drawing-in section 1 ] are formed in the field used as the boundary part of non-contact section 1C and slide contact side 1F so that it may expand to drawing 2 and may be shown. And the cross-section wedge-like gap 7 where the slide contact side 1F side narrowed between this drawing-in section 1G and hemispherical crevice 2B is maintained by forming these drawing-in section 1G. Furthermore, in this example, the distance which the above-mentioned slide contact side 1F separated from Axis L is set up so that the periphery edge of end-face 1B which \*\*\*\*s to a cam plate 3 may become smaller than the distance separated from Axis L. If it puts in another way, the location in which the above-mentioned slide contact side 1F are prepared is located in the location near [ edge / of end-face 1B / periphery ] Axis L. It coming to be easy to rock the hemispherical shoe 1 by this. Moreover, the physical relationship of the sliding section at the time of the above-mentioned slide contact side 1F sliding with hemispherical crevice 2B is set up as follows. That is, when it centers on the core O of the spherical diameter R1 of the above-mentioned hemispherical crevice 2B which becomes the axis top on the basis of the axis of hemispherical crevice 2B of a piston 2, the sliding section at the time of slide contact side 1F sliding with hemispherical crevice 2B is set as the field which consists of an axis of hemispherical crevice 2B of a piston 2 within the limits of 60 degrees. It is the field which consists of 5 times more preferably within the limits crossed to 60 degrees, and this sliding section is good to consider as the field ranging from 20 degrees to 40 degrees from the axis of hemispherical crevice 2B still more preferably.

[0008] As mentioned above, in this example, hemispherical heights side 1A of the hemispherical shoe 1 is formed as mentioned above, it draws in the edge which becomes the above-mentioned space section 4 side by it, and section 1G are formed. Therefore, the lubricating oil currently stored in the space section 4 is smoothly introduced towards slide contact side 1F through the above-mentioned gap 7, and can cool slide contact side 1F good. Therefore, the cooling effect of slide contact side 1F to a lubricating oil is good, a sliding property also has [ the hemispherical shoe 1 of this example ] it, and a life can be lengthened as compared with the former. [ good ] Furthermore, according to this example, hit width of face of hemispherical crevice 2B of a piston 2 and hemispherical heights side 1A of the hemispherical shoe 1 can be made narrower than before, and when rocking of the hemispherical shoe 1 is small, or even when whenever [ tilt-angle / of a cam plate 3 ] is small, a lubricating oil can be effectively supplied to the center of slide contact side 1F and hemispherical crevice 2B of the hemispherical shoe 1, and the sliding section. In addition, what is necessary is for the convex expressed by relation with the radii of the above-mentioned radius R2 about the field of slide contact side 1F at least just to constitute, although the convex expressed by relation with the radii of the above-mentioned radius R2 constituted fields other than non-contact section 1C in the above-mentioned hemispherical heights side 1A from the above-mentioned example.

[0009]

[Effect of the Invention] As mentioned above, according to this invention, the effectiveness that a sliding property is good and can offer a hemispherical shoe with a long life is acquired.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The sectional view showing one example of this invention

[Drawing 2] The enlarged drawing of the important section of drawing 1

[Description of Notations]

- 1 -- Hemispherical shoe 1A -- Hemispherical heights side
- 1B -- End face 1F -- Slide contact side
- 2 -- Piston 2B -- Hemispherical crevice
- 3 -- Cam plate 4 -- Space section

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